



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REVISED SAFETY ANALYSIS OF THE OPERATIONAL TRANSIENT

OF JANUARY 17, 1992

CAROLINA POWER AND LIGHT COMPANY

BRUNSWICK STEAM ELECTRIC PLANT, UNIT 1

1.0 BACKGROUND

On January 7, 1997 (Ref. 1), the Carolina Power and Light Company (CP&L) submitted a request to amend the Technical Specifications (TS) for Brunswick Steam Electric Plant (BSEP) Units 1 and 2. In the license amendment request, CP&L proposed to update the Pressure-Temperature (P-T) Limit Curves for the units to 14 and 16 effective full power years (EFPY). The NRC staff performed a review of the TS amendment request for the BSEP units, and approved the new P-T limit curves for use on October 7, 1997 (Ref. 2). However, as part of its review of pertinent Licensee Event Reports (Ref. 3) related to the amendment request, the staff questioned CP&L's evaluation of a January 17, 1992, reactor transient that occurred at BSEP, Unit 1. CP&L's evaluation concluded that the event was in compliance with the fracture toughness requirements of Appendix G to Section XI of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Appendix G to the Code, Ref. 4).<sup>1</sup>

In the summer of 1997, the staff questioned the CP&L evaluation. The staff concluded that during the event, the reactor pressure vessel (RPV) could not have been in compliance with the fracture toughness requirements of Appendix G of the Code because during normal operation, including operational transients, Appendix G of the Code requires that RPVs fabricated from ferritic materials must satisfy a safety margin of 2.0 on stress intensities resulting from operating pressure ( $K_{1p}$  values). The staff informed CP&L that during the 3 hours in question the Unit 1 RPV could not have been in compliance with the safety margin requirement because: (1) the P-T limit operating curves themselves are established by incorporating this safety margin into the P-T limit calculations; and (2) falling outside the allowable limits set by the curves would mean that the required safety margins had not been met. As a result, the staff requested that CP&L reanalyze the event, and submit a safety evaluation to assess whether the BSEP Unit 1 RPV had sufficient structural margin in it to justify continued operation of the unit.

On August 6, 1998 (Ref. 6), CP&L submitted its revised safety analysis of the BSEP Unit 1 RPV during the operating transient of January 17, 1992. The staff has completed its evaluation of

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1 As invoked by the requirements of Appendix G to Part 50 of Title 10 *Code of Federal Regulations* (10 CFR Part 50, Appendix G, Ref. 5).

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Enclosure 1

CP&L's submittal of August 6, 1998. The staff's safety evaluation (SE) of the submittal follows in Sections 2.0.

## 2.0 SAFETY EVALUATION OF THE OPERATION TRANSIENT OF JANUARY 17, 1992

CP&L's revised safety analysis for the BSEP, Unit 1, bottom head during the operational transient of January 17, 1992, was performed according to the criteria of non-mandatory Appendix E to Section XI of the ASME Boiler and Pressure Vessel Code (Appendix E to the Code, Ref. 7). Appendix E to the Code provides an acceptable method of evaluating the fracture toughness properties of ferritic components in the reactor coolant pressure boundary during anticipated operational transients. Appendix E to the Code requires a more detailed stress analysis than would be required by the methods and criteria of Appendix G to the Code. Therefore, Appendix E to the Code allows the safety margins on stress intensity factors to be reduced from a value of 2.0 to a value of 1.4.

CP&L performed a revised safety analysis and fracture toughness assessment of the BSEP, Unit 1, RPV during the operational transient January 17, 1992. CP&L's analysis was performed in accordance with the methods and criteria specified in Appendix E to the Code, and included stress intensity values arising from membrane stresses and appropriate values due to thermal and bending loads. The staff has verified that at no time during the operational transient of January 17, 1992, did the safety margins for the BSEP, Unit 1, bottom head fall below a value of 1.5. The staff therefore concludes that during the operational transient of January 17, 1992, the safety margins for the BSEP, Unit 1, bottom head satisfied the safety margin criteria of 1.4 set in Appendix E, and therefore that the BSEP, Unit 1, RPV had sufficient margin remaining against fracture to justify continued operation of the unit.

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Date:

### 3.0 REFERENCES

1. January 7, 1997 - Letter from W.R. Campbell, Vice President - Brunswick Nuclear Plant, to the U.S. Nuclear Regulatory Commission Document Control Desk, "Brunswick Steam Electric Plant, Units 1 and 2, Docket Nos. 50-325 and 50-324, License Nos. DPR-71 and DPR-62, Request for License Amendments, Pressure-Temperature Limits."
2. October 7, 1997 - Letter from D.C. Trimble, Project Manager - Project Directorate II-1, Division of Reactor Projects I/II, Office of Nuclear Reactor Regulation, U.S.N.R.C., to C.S. Hinnant, Vice President, Carolina Power and Light Company, "Issuance of Amendment No. 189 to Facility Operating License No. DPR-71 and Amendment 220 to Facility Operating License No. DPR-62 Correcting and Updating the Reactor Pressure Vessel Pressure -Temperature Limits - Brunswick Steam Electric Plant, Units 1 and 2 (TAC Nos. M97938 and M97939)."
3. September 23, 1994 - Brunswick Steam Electric Plant, Unit 1 Licensee Event Report No. 94-05-02.
4. Appendix G, "Fracture Toughness Criteria for Protection Against Failure," to Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code.
5. Appendix G, "Fracture Toughness Requirements," to Part 50 of Title 10 to the *Code of Federal Regulations*.
6. August 6, 1998 - Letter from K.R. Jury, Manager - Regulatory Affairs, Brunswick Steam Electric Plant, to the U.S.N.R.C. Document Control Desk, "Reactor Pressure Vessel Fracture Toughness Evaluation (NRC TAC Nos. MA0399 and MA0400)."
7. Appendix E, "Evaluation of Unanticipated Operating Events," to Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code.